

A CULTURAL AND TAXONOMIC STUDY OF *HYSTERIUM HYALINUM* *

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IN THE taxonomy of the Hysteriaceae considerable uncertainty has become associated with the name *Hysterium hyalinum* Cooke & Peck. Though some writers have placed the name in synonymy, others have retained it, but marked the species as a doubtful one. The misunderstanding has been due largely to an illustration (3, Pl. 81, Fig. 5) of material presumably authentic for the species, but incorrectly determined and obviously not in agreement with the type specimen. The present paper gives a revised description for this species and records for the first time the features of its pycnidial and hyphomycetous stages.¹ The notes are based upon a study of specimens from the original collection by Peck and of identical material (occurring on decorticated weathered wood, possibly *Populus*) collected by the writer at Petersham, Massachusetts, in October, 1931.²

The fungus which Cooke described (2) in 1875 as *Hysterium hyalinum* Cooke & Peck, with hyaline, cross-septate ascospores, was collected by Peck in New York. Having been described as a hyaline spored form, it was listed subsequently by Saccardo (*Sylogae*, 2) as *Glioniella hyalina* (C. & P.) Sacc. Since that time no fungi have been reported for North America under the latter name, although several records of *Hysterium hyalinum* are to be found. They are: New Jersey, by Cooke and Ellis (3) in 1876; Louisiana, by Langlois (7) in 1887; New Jersey, again, by Ellis and Gerard (6) in 1889. Identifications in these records have not been verified, since

* Contribution No. 121 from the Laboratories of Cryptogamic Botany, Harvard University.

¹ The work here reported was made in conjunction with other studies by the writer during the tenure of a National Research Council Fellowship, 1931-33, under the sponsorship of Professor William H. Weston, Jr.

² The writer is indebted to Miss E. M. Wakefield, of the Royal Botanical Garden at Kew, for a loan of the type material of this species.

the collections upon which they are based were not seen in connection with this study. The first, however, undoubtedly refers to a fungus with hyaline, muriform spores (3, p. 54, Pl. 81, Fig. 5; 4, p. 708; 1, p. 313) and represents the collection upon which Ellis placed *Hysterium hyalinum* in the synonymy of *Hysterographium gloniopsis* (Ger.) E. & E. (4), a fungus known also as *Gloniopsis Gerardiana* Sacc.

The point to be gained, then, from this historical sketch is that the name *Hysterium hyalinum* stands for a fungus with cross-septate spores which remain hyaline for some time, but, according to the observations of both Bisby and the writer, finally become brown, whereas the names *Hysterographium gloniopsis* and *Gloniopsis Gerardiana* designate a fungus with muriform spores which remain hyaline.

In discussing the type specimen of *Hysterium hyalinum*, Bisby stated: "It does not look like *Hysterium pulicare*; it may indeed be young *Hysterographium Mori* as Peck intimates." In his summary he included *H. hyalinum* Cooke & Peck among names which still remain doubtful. It occurred to the writer that an examination of the type material with respect to a possible associated pycnidial stage might offer a basis for either the complete rejection or the validation of this name, especially since he (9) had demonstrated a pycnidial stage of one type for *Hysterium pulicare* and *H. insidens* and of another type for *Hysterographium Mori* and *Gloniopsis Gerardiana*. Such a study was made, and the pycnidial stage present proved to be one of the *Hysterium* type. Besides, hysterothecia examined showed ascospores of the *Hysterium* type (Fig. 3 A-B).

THE HYSTEROTHECIAL STAGE OF THE FUNGUS

The ascigerous fructifications are typically hysteriaceous, i.e. they are elongate with a central narrow fissure, black, carbonaceous, and remain closed when wet (Fig. 3 C; Pl. XIII).³ With respect to size, form, surface features, thickness of the wall, and general habit, those of the collection from which the species was isolated are identical with those of the type, even to the extent of appearing immature. However, mature asci and spores were found in each.

³ The prominent transverse cracks in certain hysterothecia of the photomicrograph are mere breaks. They are not uncommon in weathered specimens of the Hysteriaceae and probably result from tensions produced by the periodic swelling and shrinking of the wood.

The asci of the species have no features of particular diagnostic value (Fig. 3 A). Their measurements in the type collection — these were not given by Cooke — are $75\text{--}95 \times 15 \mu$; in the Massachusetts collection, $95\text{--}110 \times 15 \mu$. The obvious discrepancy is not

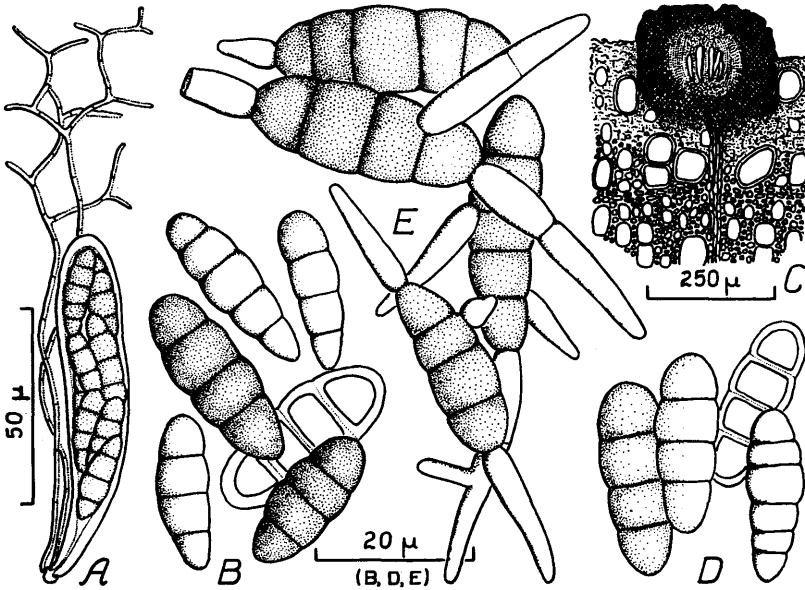


FIG. 3. Illustrating especially the hyaline to brown ascospores of *Hysterium hyalinum*. A–B from the type collection, “Peck 47” (New York); C–E from living material (Massachusetts). The drawings were outlined with the aid of the camera lucida. As they are reproduced the approximate magnifications are: A, $\times 500$; B, D–E, $\times 1000$; C, $\times 65$

a serious matter in view of the variation commonly encountered in the Hysteriaceae.

The ascospores (Fig. 3 B, D) of the fungus are largely as Cooke described them (2). They do, however, become pale brown when matured; also, occasionally, they are 4- or 5-septate. In this species apparently any cell of a viable spore is a potential germ cell (Fig. 3 E).

THE CULTIVATION OF THE FUNGUS

In the isolation of the fungus from the collection of 1931 only the yellowish to brown spores were found to germinate, and germination of such spores was obtained only after they had been sub-

jected to outdoor weathering for eight weeks in the winter season. In the cultural study the organism was grown on a maltose and malt extract medium (8, p. 147) and on oat agar, in diffused daylight at 20–25° C.

Although much slower in growth, the developing mycelia of this species resemble those of *Hysterium pulicare* in that smooth, dark, surface mats are produced without cottony aërial wefts, and in that various cells of the hyphae become pyriform or globular, thick-walled, brown, and store oil. In cultures on either medium a conidial stage of the form genus *Sporidesmium* was produced by the end of the third month, more abundantly, however, on the maltose medium than on the oat agar. Pycnidia were not formed in these cultures even after they had run for six months.

THE SPORIDESMIUM STAGE OF THE FUNGUS

The conidia as produced in culture are dark brown to opaque, constricted at the septa, granular-incrusted, and measure 12–22 ×

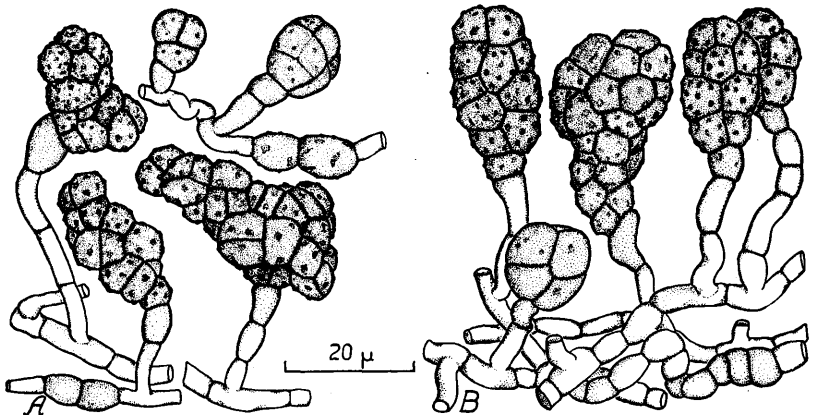


FIG. 4. Illustrating the Sporidesmium stage of *Hysterium hyalinum*, cultured from a collection made at Petersham, Massachusetts. A, conidia from ascosporous cultures; B, conidia associated with the hysterothecial stage in the field collection. The drawings were outlined with the aid of the camera lucida. As reproduced they represent a magnification of about × 825

12–16 (20) μ (Fig. 4 A). Each conidium arises by the septation of a globose cell, borne on the end of a slender, one- or several-celled conidiophore. The multicellular condition is attained by the growth and septation of the peripheral cells. Through unequal growth

variously distorted conidia obtain. When one considers the fact that the conditions affecting growth in laboratory cultures tend to produce such abnormalities in conidia of this type, the conidial stage obtained agrees very well with that associated with the hysterothecial stage in the field material.

The conidia in the field material are quite regular in form but show a considerable range in size (Fig. 4 B). They measure (12) 15–20 (25) \times (8) 10–16 (18) μ . Occurring on the wood in compact, elliptic-linear, scattered sori which range from 150 to 450 μ in length, they are noticeable to the unaided eye only as blackened areas bordering the aggregations of hysterothecia.

The identity of this conidial stage as a form species cannot be determined with satisfaction at the present time. It is highly probable that the stage has been described as a *Sporidesmium*, for no fewer than fifteen such form species, very inadequately described in the earlier literature, are based upon specimens collected upon weathered wood of deciduous species in the temperate area east of the Rocky Mountains. The described forms which are more or less similar to this stage and apparently not readily separable — forms which differ among themselves mainly with respect to such features as the presence or persistency of the conidiophore, the translucent or opaque condition and the rounded or angular form of the cells, the smooth or granular-incrusted condition of the wall; all of which without doubt are variable characteristics — include such names as: *Sporidesmium acinosum* B. & C., *S. fumosum* E. & E., *S. hysteroioides* C. & E., *S. microsporum* Ellis & Barth., *S. minutissimum* Peck, and *S. velutinum* Cooke. Disposition of the conidial stage of *Hysterium hyalinum* in a satisfactory manner requires a critical comparative study of the type materials of the species mentioned. Therefore, at present, it appears to be desirable simply to describe the stage in connection with the revised description of the species.

DIAGNOSIS AND POSSIBLE AFFINITY OF THE SPECIES

That a more adequate conception of the species may be available, the following description is based upon both the type material and the recent collection by the writer.⁴

⁴ For a satisfactory diagnosis of the type only the facts that the asci measure 75–95 \times 15 μ and that the ascospores become brown need be added to Cooke's original description.

Hysterothecia loosely aggregated and forming cinereous patches on the weathered wood, black and carbonaceous, 1.5–2 or as much as 2.5 mm. long, 0.25–0.35 mm. broad, erumpently superficial with the ends rounded when exposed, minutely rugose-punctate and occasionally faintly longitudinally striate, thick-walled, either the basal or lateral wall measuring up to 85 μ , with the longitudinal furrow prominent; *asci* cylindric-clavate, (75) 85–110 \times 15 μ , paraphysate with the paraphyses branched and interwoven above; *ascospores* irregularly biseriolate, fusiform, hyaline to pale brown, 20–26 (28) \times 6–8.5 μ , mostly 3- but occasionally 4- or 5-septate, constricted at the septa when mature.

Pycnidia (known only as an associated stage in the type collection; except for their larger size, identical with the pycnidial stage of *Hysterium insidens* Schw.; cf. 9, pp. 262–266) superficial, black, membranous and fragile, attenuate-globular and ostiolate, 75–95 μ in diameter and 95–125 μ in height, the lateral walls 8–12 μ thick; *pycnidiospores* hyaline, cylindric-inequilateral, 3–4.5 \times 0.7–1 μ , produced acrogenously on slender, bent sporulating cells which form a palisade lining the lateral and basal walls of the pycnidium.

Conidia (Sporidesmium) either scattered or in compact, elliptic-linear sori 150–450 μ long bordering the aggregations of hysterothecia, deep brown to opaque, (12) 15–20 (25) \times (8) 10–16 (18) μ , multicellular and granular-incrustated, subglobose or clavate-swollen and broadly rounded above, occasionally subcatenulate, produced on short, slender, yellowish, one- to several-celled conidiophores.

In view of the present study and published notes (9) concerning the pycnidia of *Hysterium pulicare* Pers. ex Fr., *H. insidens* Schw., *Hysterographium Mori* (Schw.) Rehm, and *Gloniopsis Gerardiana* Sacc., certain conclusions concerning the probable affinity of this species may be drawn. On the basis of the pycnidial stage present in the type material of the species *H. hyalinum* appears to be closely related to *H. pulicare* and *H. insidens*, resembling the former with respect to cultural habit and the features of the mature hymenial elements, but resembling the latter with respect to general habit and the features of the pycnidial stage. *Hysterographium Mori* and *Gloniopsis Gerardiana*, closely related species with a different pycnidial stage, appear, then, to have no close relationship with this species.

When original descriptions alone are considered, *Gloniella ambigua* Karst. appears to be the European counterpart of *Hysterium hyalinum*.

SUMMARY

A cultural study has been made of *Hysterium hyalinum* Cooke & Peck; the species was isolated from material collected in 1931 near Petersham, Massachusetts. In verifying the identification a portion of Peck's original collection of the species was examined. The results of the cultural and taxonomic studies and the significance of each may be briefly summarized as follows:

1. The fungus collected in Massachusetts was found to agree with the type of *H. hyalinum* with respect to all of the important features of the hysterothecial stage. The writer has referred it to this species despite the facts that it lacks the pycnidial stage associated with the hysterothecia in the type material and that it has in association, instead, a hyphomycetous stage of the Sporidesmium type.

2. The Sporidesmium stage was obtained in ascosporous cultures of the fungus on laboratory media.

3. The pycnidial stage in the type material of *H. hyalinum* agrees, except for its larger pycnidia, with that of *H. insidens*.

4. In consideration of the features of the ascospore and of the pycnidium in the type material alone, the writer suggests that *H. hyalinum* be accepted as a valid name and that it be removed from the synonymy of *Hysterographium gloniopsis* (Ger.) E. & E. listed by Ellis (4).

5. No connection between the form genus Sporidesmium and species of *Hysterium* has heretofore been demonstrated, or suggested.

6. The need of critical systematic studies within the group of saprophytic dematiaceous Fungi Imperfecti to facilitate investigations of this kind in the Pyrenomycetes is clearly shown by this study.

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PLATE XIII



Hysterium hyalinum Cooke & Peck. Collected by M. L. Lohman near Petersham
Massachusetts, October, 1931. About $\times 45$